

Lecture No. 1

Trauma

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TRAUMA

- **Trauma** is the study of medical problems associated with physical injury.
- The **injury** is the adverse effect of a physical force upon a person.
- A variety of forces that can lead to injury eg. physical (thermal, ionising radiation) and chemical.
- Mostly injuries are due to mechanical force.
- **Clinically; Trauma can be divided into:**
 - 1. Serious & life-threatening injury.
 - 2. Significant trauma requiring treatment, but not immediately life threatening.
 - 3. Non-significant trauma.
- **Trauma is the leading cause of death and disability in the first 4 decades of life and is the 3rd most common cause of death overall.**
- Millions of people are killed or disabled by injury / year.
- 100s of 1000s who survived experience long-term or permanent disabilities.
- An injury affects more than just the injured person; it affects everyone who is involved in the injured person's life.
- The great majority of injuries are not life- or limb-threatening.
- In children, one must always be alert to the potential for non-accidental injury (**NAI**).

MANAGEMENT OF TRAUMA / ATLS

- -An approach to traumatized pt. is different from a pt. with undiagnosed medical condition where a detailed hx, past medical/surgical hx, physical exam from head to toe needed, also DDX & investigations requested to confirm or refute a dx.
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- In trauma case, it is not possible to obtain such information immediately; that's why a standardized protocol of management is required (Advanced Trauma Life Support **ATLS**).
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- **The importance of time**
- At time zero, the person/patient is at their normal baseline. Then some interaction with an external force leading to injury will start.
- Subsequent development of pathology, Response of the body by way of compensation and healing, and the External responses by health professionals all have a timeline.
- The timeline may be used to compare the progress from time zero to other significant events or deadlines that follow.
eg. obstructed airway, a tension pneumothorax tend to progress if left untreated.
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- **ATLS (Advanced Trauma Life Support) system defines an order of priorities given by ABCD; that is airway, breathing, circulation and disability (neurology).**

Steps in ATLS system are:

■ **Primary** survey with simultaneous resuscitation identify & treat what is killing pt.

■ **Secondary** survey – identify all other injuries

■ **Tertiary** survey / Definitive care – definitive management plan

- -An injury may be found by careful physical examination or need special investigation.
- -It becomes obvious at different points on its timeline; eg. in extradural haematoma the initial skull fracture may be visible on Xray or CT as haematoma develops it will first be visible on CT later it will be suspected on CE; finally, it will become clinically very obvious.
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- Once an obstructed airway is identified, the response time may be a seconds.
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- **Reducing the diagnosis time & response time is vital before death or irretrievable damage.**
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- **The diagnosis time is time between injury and recognition of the problem.**
- **The response time is the time between identifying the problem and effective intervention being completed.**
- We can reduce these times by using a practised protocol to the initial stages of the mx of an injured patient.
- History, CE, provisional dx, special investigations, dx and mx plan is not appropriate under this pressure.
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- **Never forget COMORBIDITIES**
- **Never forget minor injuries.**
- **The assessment of trauma**
- The relationship can be expressed simply as: mechanism + patient = injury.
- **Problem may be (overt) or (covert).**
- **-We need to convert everything to the overt.**
- We can only treat what we have found.
- So some investigations needed to reach to the hidden injuries.

Mechanism of trauma

Blunt or penetrating or could be mixed

eg. incision caused by a knife.

- Good history of length of blade with an entry point gives a hint about potential pattern of injury confirmed or excluded by exam, special investigation or wound exploration.
- An incisional injury over an extremity is readily evaluated; the distal perfusion, peripheral nerve function, tendon and muscle function all assessed by clinical exam; which structures are at risk.
- This may be simple, but it is not always easy to determine the direction that a blade entered.
- A notable feature of stab injuries is that they are often eminently treatable



Firearms injuries

- Penetrating injuries caused by **firearms** are not so easily understood as incisional injuries; could be:

1.Low-velocity projectile behaves more or less like a stabbing injury; but as velocity increases, the energy increases in line as the amount of energy increases. Eg.pistols

2.High-velocity bullet crushes particles of the human body in its pathway and produces lateral acceleration away from the point of impact. This motion of the tissue particles away from their original position produces a cavity. High-velocity projectiles are designed to kill. eg. Sniper

2 types of cavity are produced:

- (1) **permanent** cavity; that remains after the initial impact;
- (2) **temporary** cavity; that lasts for milliseconds, and may no longer be apparent during the physical examination. This temporary cavitation can extend well beyond the boundaries of the apparent injury.

Firearm injuries

- **Low-velocity bullets behave like knife injuries**
- **High-velocity bullets cause cavitation**
- **The temporary cavity is large and draws in foreign materials**
- **The permanent cavity is smaller and gives no clue to the extent of damage.**

Gunshot / shotgun

A blunt mechanism of injury;

direct or indirect.

Direct mechanism; when the damage occurs at or close to the site of impact.

Indirect m. when the damage occurs at a distant site after transmission of that force.

- A compressive force to abdomen will cause a rise in pressure. A sudden back pressure at the heart can lead to damage to the valves.
- The results of direct mechanisms are easier to understand as the damaging effects are often more localised.
- Even when the patient was alert before and after the event, it can be difficult to be sure of the mechanism as it affected the injured part.
- ***Patient factors***
- Individuals with different physical characteristics and medical histories will respond differently to mechanical insult.
- **Children, adults and the elderly are three obvious separate groups.**
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- ***Obvious injuries***
- Some injuries are so obvious. The most obvious injuries will be those that are visible externally. It is for this reason that there is an E at the end of ABCDE in the ATLS system: E is for exposure.
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- A contusion over the knee of a driver suggests a dashboard injury. Finger-shaped bruises on a child's arms suggest non-accidental injury (**NAI**).
- ***Hidden factors***
- **Mechanisms**
- Conscious sensible patients will generally tell the truth; sometimes to protect themselves or others they may fabricate a mechanism. The risk here is that if the mechanism is incorrect.

Factors suspicious of the history that NAI has occurred are:

- history clearly inconsistent with the injuries
- changing history;
- aggressive behaviour of carers at interview;
- injuries of different ages;
- posterior rib injuries;
- long bone fractures in a pre-ambulatory child.

We need to not only identify injuries that need treatment, but also protect patients from further harm.

- An analogous situation applies with child abuse – if we ignore the early signs, we may be too late to prevent the later episode in which real harm is done.
- **Non Accidental Injury (NAI)** is a very difficult problem to deal with.
 - **Covert mechanisms**
 - Patients usually tell the truth, but may not if criminal activity is involved
 - Fear of abuse may prevent vulnerable patients telling the truth
 - If a non-accidental injury (NAI) is suspected, you have a responsibility to take action
 - Patients likely to have covert medical problems need careful checking even if their injury appears to have a simple mechanical cause
 - **Patients**
 - Injury in the older patient may be the manifestation of general health problems. The obvious injury may be the fractured proximal femur, the hidden patient factor may be the TIA or abnormal cardiac rhythm.

Injuries

Looking for hidden injury when deduction has failed can follow two methods:

1 the look everywhere approach;

2 the focused exclusion approach.

- **1 The look everywhere approach.**

By Secondary survey we can.... ; once the initial life-saving manoeuvres have been completed you look everywhere for further injury/s. The look everywhere secondary survey comes later in ATLS approach.

- **2 The focused exclusion approach.**

Some important injuries or conditions are for some reason missed. This suggests that a normal deductive approach is not always adequate. Therefore, if such injuries are suspected or possibly present they should be positively excluded by focused history, examination and investigation.

Trauma assessment

Know the timelines for important diagnoses

Prioritise the assessment accordingly

Positively exclude critical diagnoses

If required, screen at-risk patients before clinical signs are apparent

- **The response to trauma**

- On the positive side, physiological compensatory and reserve mechanisms will be recruited and healing processes will be initiated. Countering this, there may be progressive pathophysiological responses, the consumption of limited resources and decompensation.
- The patient's own homeostatic mechanisms will respond to the injury and there will be physiological and pathophysiological changes.
- A simple example is body temperature. A drop in body temperature is common after injury; this may be due to exposure, inactivity, damp, blood loss or loss of vasomotor control. The body's own thermoregulatory mechanisms may not be able to resolve the problem and so we must be prepared to support – body temperature should be monitored and heat loss prevented.

- **The medical response to injury**

- ***Initial management (ATLS)***

- **Trauma team**'; this will allow a trained team of nurses and doctors to be waiting to meet the patient.
- While waiting, equipment is made ready, a leader is identified and each team member is given a role.
- Protective clothing.

- ***Beyond the first hour***

- In some circumstances we need the so called '**damage control surgery**' then definitive treatment when the patient is stable. When necessary the patient can be transferred to the more controlled environment of an intensive care unit and return for definitive surgery when physiologically and immunologically better able to tolerate it; this may be hours or days later.